

FORM PTO-1390 (REV 11-98)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 361.034	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO (if known, see 37 CFR 1.5) <b>10/088159</b>	
INTERNATIONAL APPLICATION NO PCT/DE00/02362		INTERNATIONAL FILING DATE July 18, 2000		PRIORITY DATE CLAIMED September 9, 1999	
TITLE OF INVENTION VACUUM HOLDING DEVICE					
APPLICANT(S) FOR DO/EO/US Harald RISTAU					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<p>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371</p> <p>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1)</p> <p>4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been transmitted by the International Bureau.</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) -</p> <p>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p style="margin-left: 20px;">d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))</p> <p>Items 11. to 16. below concern document(s) or information included:</p> <p>11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included</p> <p>13. <input checked="" type="checkbox"/> A <b>FIRST</b> preliminary amendment</p> <p style="margin-left: 20px;"><input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information: Drawings (2 sheets) International Preliminary Examination Report in German w/ Amended Claims (4 sheets) and Amended Drawing (one sheet) Amended Claims (4 sheets) and Amended Drawing (one sheet) w/ English Translation</p>					

10/088159

PCT/DE00/02362

JC18 Received at the PTO 14 MAR 2002

21. ☒ The following fees are submitted:

## BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):

Neither international preliminary examination fee (37 CFR 1.482)  
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO  
and International Search Report not prepared by the EPO or JPO. .... \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to  
USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO  
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO  
but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO  
and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

## CALCULATIONS PTO USE ONLY

\$1000.00

\$1000.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	- 20 =		x \$18.00
Independent claims	- 3 =		x \$80.00

\$

\$

\$

\$

MULTIPLE DEPENDENT CLAIM(S) (if applicable)

+ \$270.00

\$

TOTAL OF ABOVE CALCULATIONS =

\$

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above  
are reduced by 1/2.

\$

SUBTOTAL =

\$1000.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

TOTAL NATIONAL FEE =

\$1000.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

TOTAL FEES ENCLOSED =

\$1000.00

Amount to be  
refunded:

\$

charged:

\$

- PTO FORM 2038 for \$1000.00 is enclosed.
- a. ☒ A check in the amount of \$ \_\_\_\_\_ to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
overpayment to Deposit Account No. 02-2275. A duplicate copy of this sheet is enclosed.
- d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card  
information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Bierman, Muserlian and Lucas  
600 Third Avenue  
New York, NY 10016



20311

PATENT TRADEMARK OFFICE

SIGNATURE

Charles A. Muserlian

NAME

19,683

REGISTRATION NUMBER

361.034

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: :  
Harald RISTAU :  
PCT/DE00/02362 : PCT Date: July 18, 2000  
Serial No.: :  
Filed: Concurrently Herewith :  
For: VACUUM HOLDING DEVICE :  
600 Third Avenue  
New York, NY 10016  
March 13, 2002

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents  
Washington, D.C. 20231

Sir:

Please amend this application as follows:

IN THE SPECIFICATION:

Page 1, before line 1, insert

--This application is a 371 of PCT/DE00/02362 filed July  
18, 2000.--

IN THE CLAIMS:

Claim 3 (amended) The vacuum holding device (1) according to  
claim 1 wherein the connection between the vacuum chamber (5) and  
the external environment has a conical, spherical or hemispherical  
bearing surface (8) to accommodate the valve (9).

Claim 4 (amended) The vacuum holding device (1) according to claim 1 wherein at least in the regions in contact with the bearing surface (8), the valve (9) consists of a rubber elastic material.

Claim 5 (amended) The vacuum holding device (1) according to claim 1 wherein one part of the means for producing a detachable, substantially gastight coupling from the upwardly directed opening is a surface.

Claim 6 (amended) The vacuum holding device (1) according to claim 1 wherein the detachable, substantially gastight coupling is formed by a rubber seal between the surface and attachment of the device to produce a vacuum.

Claim 7 (amended) The vacuum holding device (1) according to claim 1 wherein the surface (12) for attaching the device to produce a vacuum is directed to the contact surface (14) of the vacuum holding device (1).

Claim 8 (amended) The vacuum holding device (1) according to claim 1 wherein the vacuum holding device (1) has a holding receptacle for the equipment holder.

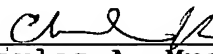
Claim 9 (amended) A method for securing a vacuum holding device (1) by means of an apparatus for producing a vacuum according to claim 1 to a contact surface (14) comprising:



**REMARKS**

The amendment is submitted to insert reference to the PCT application and to remove multiple dependency from the claims.

Respectfully submitted,  
BIERMAN, MUSERLIAN AND LUCAS

  
Charles A. Muserlian, #19,683  
Attorney for Applicant(s)  
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CAM:sd

Enclosures: Marked-Up Version of Specification and Claims  
Return Receipt Postcard

This application is a 371 of PCT/DE00/02362 filed July 18, 2000.  
The invention relates to a vacuum holding device with a vacuum chamber and valve for permanent holding to surfaces substantially impermeable to gas.

Vacuum holding devices such as suction-cup fastenings are inherently known. Conventional suction-cup fastenings have a suction cup which is made of an elastic plastic material and should ensure an airtight seal between the suction cone and a smooth, gas-impermeable contact surface, e.g. a bathroom tile. The vacuum required for the adhesive action in the suction chamber is produced by pressing the plate-shaped suction surface onto the contact surface whereby air escapes from the suction chamber and a vacuum is produced by means of the restoring force of the elastic material. If necessary, surface adhesion forces are also involved in the adhesive action.

Also known are suction-cup fastenings which allow easy removal of the suction-cup fastening from the contact surface, where by means of a seal to be opened, the vacuum in the suction chamber is raised by equalising with the ambient pressure. For this purpose US 5,511,752 proposes a cap mounted displaceably on a suction cup wherein the sliding or lifting of the cap brings about the opening of the suction chamber to the outside and an inflow of ambient air. The vacuum responsible for the suction action is removed, which releases the suction cap.

US 5,553,837 also discloses a vacuum holding device for workpieces which has vacuum chambers and airtight-closing seals to the bearing surfaces in order to hold workpieces tightly on surfaces by application of vacuum by means of a connection to a vacuum pump or to release them again by re-establishing normal pressure.

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MARKED-UP VERSION OF CLAIMS

PCT/DE00/02362

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## CT,ATMS

1. A vacuum holding device (1) with apparatus for producing a vacuum, wherein

- The vacuum holding device (1) and the apparatus for producing a vacuum are constructed in two parts and can be detached and connected substantially gastight by positioning,

wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of a contact surface (14),
- an opening at the end of a connection from the vacuum chamber to the external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7),
- means for producing a detachable substantially gastight coupling between the outwardly directed opening and a device to produce a vacuum.

characterised in that

- the vacuum holding device (1) has a seal (15) which seals the vacuum chamber gastight against the contact surface (14) towards the outside,

and the apparatus for producing a vacuum has

- a piston suction pipe (13) which has openings at the beginning (24) and at the end of the suction path (26).



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2. The vacuum holding device (1) according to Claim 1, characterised in that the valve (9) is constructed as substantially conical, spherical or hemispherical.
3. The vacuum holding device (1) according to <sup>claim 1</sup> ~~one of the~~ <sup>wherein</sup> ~~preceding claims,~~ characterised in that the connection between the vacuum chamber (5) and the external environment has a conical, spherical or hemispherical bearing surface (8) to accommodate the valve (9).
4. The vacuum holding device (1) according to <sup>claim 1, wherein</sup> ~~one of the~~ ~~preceding claims,~~ characterised in that, at least in the regions in contact with the bearing surface (8), the valve (9) consists of a rubber elastic material.
5. The vacuum holding device (1) according to <sup>claim 1</sup> ~~one of the~~ <sup>wherein</sup> ~~preceding claims,~~ characterised in that one part of the means for producing a detachable, substantially gastight coupling from the upwardly directed opening is a surface.
6. The vacuum holding device (1) according to <sup>claim 1</sup> ~~one of the~~ <sup>wherein</sup> ~~preceding claims,~~ characterised in that the detachable, substantially gastight coupling is formed by a rubber seal between the surface and attachment of the device to produce a vacuum.
7. The vacuum holding device (1) according to <sup>claim 1</sup> ~~one of the~~ <sup>wherein</sup> ~~preceding claims,~~ characterised in that the surface (12) for attaching the device to produce a vacuum is directed parallel to the contact surface (14) of the vacuum holding device (1).
8. The vacuum holding device (1) according to <sup>claim 1</sup> ~~one of the~~ <sup>wherein</sup> ~~preceding claims,~~ characterised in that the vacuum holding device (1) has a holding receptacle for the equipment holder.

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9. A method for securing <sup>a</sup>the vacuum holding device (1) by means of an apparatus for producing a vacuum according to <sup>claim 1</sup>one of the preceding claims to a contact surface (14), <sup>comprising</sup>characterised by the following steps:

- positioning the vacuum holding device (1) on a contact surface (14),
- producing a detachable, substantially gastight coupling between the outwardly directed opening of the vacuum holding device (1) and the piston suction pipe (13),
- producing a vacuum in the vacuum chamber (5) by withdrawing the suction piston (28) from the piston suction pipe (13) until the suction piston (28) passes an upper opening (26) and
- removing the apparatus for producing a vacuum.

10. A vacuum holding device (1), wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of the contact surface (14),
- an opening at the end of a connection between the vacuum chamber and the external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7) and
- means for producing a detachable substantially gastight coupling between the outwardly directed opening and an apparatus for producing a vacuum,
- the valve (9) is constructed as substantially conical, spherical or hemispherical and
- the connection between the vacuum chamber (5) and the external environment has a conical, spherical or hemispherical bearing surface (8) to accommodate the valve (9),

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characterised in that

the vacuum holding device has a seal (15) which closes the vacuum chamber gastight towards the outside against the contact surface (14) and  
- the valve (9) extends downwards as a strip or rod.

11. The vacuum holding device (1) according to Claim 10, characterised that at the end of the strip or rod there is at least one support, preferably in the form of at least one pin or wedge.

12. The vacuum holding device (1) according to Claim 10 ~~or 11~~ <sup>wherein</sup> characterised in that the strip or rod-shaped extension of the valve (9) is elastic in order to hold the valve in the bearing surface.

13. The vacuum holding device (1) according to ~~one of~~ <sup>wherein</sup> Claims 10 to 12, characterised in that the seal (15) is a flat seal made of elastic material.

14. The vacuum holding device (1) according to ~~one of~~ <sup>wherein</sup> Claims 1 to 13, characterised in that the seal (15) is a flat seal made of an elastic material.

SK

REC'D PCT/PTO

14 MAR 2002

10/088159

WO 01/20177

PCT/DE00/02362

Vacuum holding device

The invention relates to a vacuum holding device with a vacuum chamber and valve for permanent holding to surfaces substantially impermeable to gas.

Vacuum holding devices such as suction-cup fastenings are inherently known. Conventional suction-cup fastenings have a suction cup which is made of an elastic plastic material and should ensure an airtight seal between the suction cone and a smooth, gas-impermeable contact surface, e.g. a bathroom tile. The vacuum required for the adhesive action in the suction chamber is produced by pressing the plate-shaped suction surface onto the contact surface whereby air escapes from the suction chamber and a vacuum is produced by means of the restoring force of the elastic material. If necessary, surface adhesion forces are also involved in the adhesive action.

Also known are suction-cup fastenings which allow easy removal of the suction-cup fastening from the contact surface, where by means of a seal to be opened, the vacuum in the suction chamber is raised by equalising with the ambient pressure. For this purpose US 5,511,752 proposes a cap mounted displaceably on a suction cup wherein the sliding or lifting of the cap brings about the opening of the suction chamber to the outside and an inflow of ambient air. The vacuum responsible for the suction action is removed, which releases the suction cap.

US 5,553,837 also discloses a vacuum holding device for workpieces which has vacuum chambers and airtight-closing seals to the bearing surfaces in order to hold workpieces tightly on surfaces by application of vacuum by means of a connection to a vacuum pump or to release them again by re-establishing normal pressure.

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DE 40 13 747 or WO 97/11282 disclose how the suction action of a suction cup is produced by means of a hand pump connected securely to the suction cup or is re-established again in the event of pressure loss.

The afore-mentioned embodiments either do not allow any permanent holding on especially rough surfaces or they have such complex structures that they cannot be manufactured easily and at low cost.

The object of the invention is to overcome known disadvantages from the prior art and provide an alternative to adhesive or plug fastening which is of similar permanent strength, can also be removed easily and without damage to the surfaces and does not have the disadvantage of conventional suction cups, of adhering only to very smooth surfaces and not permanently.

The object is solved according to the invention by a vacuum holding device 1, which has:

- a vacuum chamber 5 which is open to a contact surface 14,
- a seal 15 which closes the vacuum chamber gas-tight from the outside towards the contact surface 14,
- an opening as the end of a connection between the vacuum chamber and the external environment 7,
- a valve 9 which ensures gas-tight closure and opening of the connection between the vacuum chamber 5 and the external environment 7 and
- means for producing a detachable, substantially gastight coupling between the outwardly directed opening and a device for generating vacuum 13.

Preferred embodiments are the subject of the subclaims.

The vacuum holding device is preferably made of plastic, e.g., of an impact-resistant plastic such as ABS and is

The seal which closes the vacuum chamber gastight towards the outside against the contact surface is preferably a flat seal made of an elastic material, if necessary provided on one side and/or on both sides with compensating

ribs. The elastic material preferably exhibits an optimised hardness and elasticity in relation to the contact surface.

The apparatus for producing the vacuum is preferably a manual, i.e., hand-actuated, piston suction pipe which has openings at the beginning and at the end of the suction path. The piston suction pipe has a piston pull rod with built-in tension holding device and also a suction piston which is preferably made of elastic material such as rubber and is sealed against the suction pipe, for example, using sealing lips. In order that the piston suction pipe can also be used in the vertical position, the lower opening of the suction pipe can be also be connected at an angle to the detachable coupling. If necessary, the piston suction pipe can also have, centrally at the lower opening, a retaining device for the valve, perhaps a dome, which prevents the valve from being lifted out of the receiving surface by the suction action of the piston suction pipe. The device for producing the vacuum and the vacuum holding device are constructed in two parts.

According to a preferred embodiment, the vacuum holding device is positioned on the contact surface and the piston suction pipe with a seal located at the lower opening is placed on the coupling surface under a slight supporting pressure. By withdrawing the piston pull rod from the suction pipe, the valve is slightly raised from the pre-stressing and the atmosphere still present is largely extracted from the vacuum chamber. At the instant when the suction piston passes the upper opening, which is preferably formed by the pipe itself still open at the top in the cross-section, the conical/spherical valve is pressed against its bearing surface by the pre-stressing and the pressure difference now built up, and closes the vacuum chamber airtight against the external pressure. When passing the upper opening, it is important that a large quantity of ambient air enters the suction piston at once

so that the valve of the vacuum holding device closes as quickly as possible as a result of the sudden change in pressure. The correct handling of the piston suction pipe can be monitored by a loudly perceivable "plop" when the piston pull rod is withdrawn from the suction pipe.

The vacuum holding device can easily be removed from the bearing surface by opening the valve. The valve is opened by deforming or moving it by lateral pressure e.g. with the finger, wherein a connection is established with the external environment and pressure equalisation is brought about between the ambient pressure and the vacuum chamber.

All substantially air-impermeable base materials such as ceramic, earthenware, plastic-coated woods, glass or metal surfaces are suitable for applying the vacuum holding device. In particular, even for rough structures no holes or other insertion of screws or nails which damage the holding surfaces is required for a permanent hold. The vacuum holding device according to the invention allows a reversible and disturbance-free attachment.

According to a further embodiment of the invention, at its upper side facing away from the holding surface, the vacuum holding device has a device configured as a receptacle which can, for example, accommodate equipment or holders for accommodating objects. The receiving device can be designed so that it can accommodate a wide range of accessories in the sense of a system.

The receiving device is preferably designed as swallowtail-shaped, wherein the connection is made by pushing onto the narrower side of the swallowtail.

The upper side can also be designed so that it allows the possibility of a screw fastening by constructing, for example, on the upper side a thread, a hole or some other



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receptacle for a screw fastening. The screw fastening can be used to accommodate a hook.

In an embodiment not according to the invention, the vacuum holding device can also be used as a single-point fastening by screwing a screw through the dome into the holding surface. Twisting of the vacuum holding device can be prevented by the flat seal which is present. The vacuum holding device sits securely and free from rotation on the holding surface.

The vacuum holding device can be used for example, in the household, in motor caravans, sailing boats, motor yachts, on high-quality wainscoting, in fair construction or in medicine, possibly in operating theatres, especially in those areas where no screwing or sticking can or may be used.

The object of the invention is explained in greater detail subsequently with reference to the drawings.

Figure 1 shows the vacuum holding device from above.

Figures 2 and 3 show the vacuum holding device in a side view (Figure 2) or from below (Figure 3).

Figure 4 shows a section through the vacuum holding device along the line A-B.

Figure 5 shows the piston suction pipe placed on the vacuum holding device.

The vacuum holding device 1 has on its upper side a holding receptacle 2 for the equipment holder in a swallowtail shape. On the short, upwardly directed side 3 of the holding receptacle there is pushed on the equipment holder which is securely anchored by pushing downwards in the

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direction of the long side 4 of the swallowtail-shaped holding receptacle 2. The vacuum holding device 1 is constructed such that it is substantially round wherein the outer wall of the vacuum chamber 5 extends downwards in a plate-shaped fashion. At the centre is shown the dome 6 to produce a connection between the vacuum chamber 5 and the external environment 7. The dome 6 has a cylindrical shape in the downward direction and a round, substantially hemispherical opening extending outwards in the upward direction which forms the bearing surface 8 for the spherical valve 9. The bearing surface has a circular groove 10 which provides an airtight seal with the other surface of the spherical valve. The circular surface 12 directed parallel to the contact surface 14 and, if necessary, the upper and/or lateral outer upper edge 11 of the dome, form sealing surfaces to produce a detachable airtight coupling with the suction pipe 13.

The vacuum chamber 5 extends downwards towards the contact surface 14 in a plate-shaped fashion. The airtight closure of the vacuum chamber to the contact surface is accomplished by a flat seal 15 which is inserted circularly in a receiving surface 16 at the edge 17 of the vacuum chamber. The flat seal can, if necessary, have ring-shaped grooves 18 on both sides.

The dome 6 is constructed so that it is guided downwards in a pipe shape until just above the bearing surface. This has the advantage that during the formation of a vacuum yielding contact surfaces cannot bulge excessively upwards and are retained by the lower end of the dome 19. As a precaution there are slits 20 located at the lower end of the dome 19 which ensure that, during the production of a vacuum, the vacuum chamber can be sufficiently well evacuated even if the contact surface is upwardly bulging. The dome also has on its inside a projection 21 which is constructed so that it fixes the valve sphere with an

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elastic extension 22 and a pin- or wedge-shaped support 23 in the bearing surface 8 under elastic stress by means of the upper edge of the support 23.

The upper and lateral outer upper edge 11 of the dome and the circular surface 12 located beneath it, directed parallel to the contact surface 14 form, as it were, sealing surfaces to produce a detachable airtight coupling with the piston suction pipe 13. The suction pipe to produce a vacuum is also constructed as a piston suction pipe which has openings at the beginning and at the end of the suction path. The lower opening of the suction pipe 24 is closed by a seal in the form of a circular rubber 25. The upper opening is formed 26 by the suction pipe open at the top. The piston suction pipe also has a piston pull rod 27 with built-in tension holding device and a suction piston 28 which is preferably made of elastic material such as rubber and is sealed against the suction pipe with sealing lips 29.

The upper edge of the dome can be closed by a cap 30 which can be removed, for example, by inserting a screwdriver head in an outlet or projection 31 in the cap itself or in the surface 12. The cap also has the effect of pressing the elastic valve through the inner surface of the cap cover into the bearing surface 8 of the dome, providing additional sealing.

List of reference symbols

- 1 Vacuum holding device
- 2 Holding receptacle
- 3 Short side of holding receptacle
- 4 Long side of holding receptacle
- 5 Vacuum chamber
- 6 Dome
- 7 External environment, outside
- 8 Bearing surface
- 9 Valve
- 10 Circular grooves of bearing surface
- 11 Outer upper edge of dome
- 12 Surface
- 13 Piston suction pipe
- 14 Contact surface
- 15 Flat seal
- 16 Receiving surface
- 17 Edge of vacuum chamber
- 18 Annular grooves of flat seal
- 19 Lower end of dome
- 20 Slits in dome
- 21 Projection in dome
- 22 Elastic extension
- 23 Pin- or wedge-shaped support
- 24 Lower opening of suction pipe
- 25 Circular rubber
- 26 Suction pipe
- 27 Piston pull rod
- 28 Suction piston
- 29 Sealing lips
- 30 Cap
- 31 Outlet

PCT/DE00/02362

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## CLAIMS

- the vacuum holding device (1) and the apparatus for producing a vacuum are constructed in two parts and can be detached and connected substantially gastight by positioning,

wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of a contact surface (14),
- an opening as the end of a connection from the vacuum chamber to the external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7),
- means for producing a detachable substantially gastight coupling between the outwardly directed opening and a device to produce a vacuum.

characterised in that

- the vacuum holding device (1) has a seal (15) which seals the vacuum chamber gastight against the contact surface (14) towards the outside,

and the apparatus for producing a vacuum has

- a piston suction pipe (13) which has openings at the beginning (24) and at the end of the suction path (26).

AMENDED PAGE

2. The vacuum holding device (1) according to Claim 1, characterised in that the valve (9) is constructed as substantially conical, spherical or hemispherical.
3. The vacuum holding device (1) according to one of the preceding claims, characterised in that the connection between the vacuum chamber (5) and the external environment has a conical, spherical or hemispherical bearing surface (8) to accommodate the valve (9).
4. The vacuum holding device (1) according to one of the preceding claims, characterised in that, at least in the regions in contact with the bearing surface (8), the valve (9) consists of a rubber elastic material.
5. The vacuum holding device (1) according to one of the preceding claims, characterised in that one part of the means for producing a detachable, substantially gastight coupling from the upwardly directed opening is a surface.
6. The vacuum holding device (1) according to one of the preceding claims, characterised in that the detachable, substantially gastight coupling is formed by a rubber seal between the surface and attachment of the device to produce a vacuum.
7. The vacuum holding device (1) according to one of the preceding claims, characterised in that the surface (12) for attaching the device to produce a vacuum is directed parallel to the contact surface (14) of the vacuum holding device (1).
8. The vacuum holding device (1) according to one of the preceding claims, characterised in that the vacuum holding device (1) has a holding receptacle for the equipment holder.

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9. A method for securing the vacuum holding device (1) by means of an apparatus for producing a vacuum according to one of the preceding claims to a contact surface (14), characterised by the following steps:

- positioning the vacuum holding device (1) on a contact surface (14),
- producing a detachable, substantially gastight coupling between the outwardly directed opening of the vacuum holding device (1) and the piston suction pipe (13),
- producing a vacuum in the vacuum chamber (5) by withdrawing the suction piston (28) from the piston suction pipe (13) until the suction piston (28) passes an upper opening (26) and
- removing the apparatus for producing a vacuum.

10. A vacuum holding device (1), wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of the contact surface (14),
- an opening as the end of a connection between the vacuum chamber and the external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7) and
- means for producing a detachable substantially gastight coupling between the outwardly directed opening and an apparatus for producing a vacuum,
- the valve (9) is constructed as substantially conical, spherical or hemispherical and
- the connection between the vacuum chamber (5) and the external environment has a conical, spherical or hemispherical bearing surface (8) to accommodate the valve (9),

characterised in that

- the vacuum holding device has a seal (15) which closes the vacuum chamber gastight towards the outside against the contact surface (14) and
  - the valve (9) extends downwards as a strip or rod.
11. The vacuum holding device (1) according to Claim 10, characterised that at the end of the strip or rod there is at least one support, preferably in the form of at least one pin or wedge.
  12. The vacuum holding device (1) according to Claim 10 or 11, characterised in that the strip or rod-shaped extension of the valve (9) is elastic in order to hold the valve in the bearing surface.
  13. The vacuum holding device (1) according to one of Claims 10 to 12, characterised in that the seal (15) is a flat seal made of elastic material.
  14. The vacuum holding device (1) according to one of Claims 1 to 8, characterised in that the seal (15) is a flat seal made of an elastic material.

SK



(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES  
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**(43) Internationales Veröffentlichungsdatum**  
**22. März 2001 (22.03.2001)**

**(10) Internationale Veröffentlichungsnummer**  
**WO 01/20177 A1**

## PCT

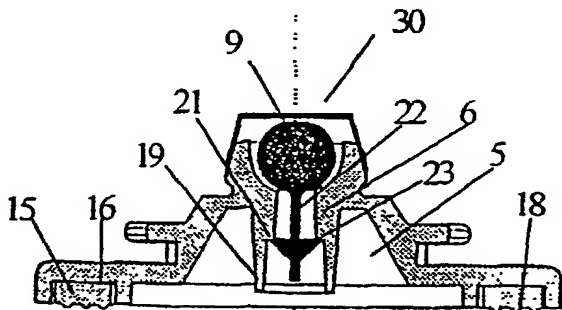
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| <p>(51) Internationale Patentklassifikation<sup>7</sup>: F16B 47/00</p> <p>(21) Internationales Aktenzeichen: PCT/DE00/02362</p> <p>(22) Internationales Anmeldedatum:<br/>18. Juli 2000 (18.07.2000)</p> <p>(25) Einreichungssprache: Deutsch</p> <p>(26) Veröffentlichungssprache: Deutsch</p> <p>(30) Angaben zur Priorität:<br/>299 16 197.8 15. September 1999 (15.09.1999) DE</p> <p>(71) Anmelder und</p> <p>(72) Erfinder: <u>RISTAU, Harald</u> [DE/DE]; Vor dem Hassel 8,<br/>D-21438 Brackel (DE).</p> <p>(74) Anwälte: MÜLLER, Hans-Jürgen usw.; Müller,<br/>Schupfner &amp; Gauger, Karlstrasse 5, D-21244 Buchholz<br/>(DE).</p> | <p>(81) Bestimmungsstaaten (<i>national</i>): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.</p> <p>(84) Bestimmungsstaaten (<i>regional</i>): ARIPO-Patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI-Patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Veröffentlicht:</b><br/>— Mit internationalem Recherchenbericht.</p> <p><i>Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.</i></p> |
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- (54) Title: LOW-PRESSURE HOLDING DEVICE
- (54) Bezeichnung: UNTERDRUCK-HALTEVORRICHTUNG



- (57) Abstract:** The invention relates to a low-pressure holding device (1) with a low-pressure chamber (5) and a valve (9) for the permanent hold on gas-impermeable surfaces (14). The low-pressure holding device is fixed to a supporting surface by means of a piston suction pipe (13) which is detachably connected to the inventive device. The low-pressure holding device can be provided with a receptacle for holding appliances (2).

- (57) Zusammenfassung: Gegenstand der Erfindung ist eine Unterdruck-Haltevorrichtung (1) mit Unterdruckkammer (5) und Ventil (9) zum dauerhaften Halt auf gasundurchlässigen Oberflächen (14). Die Unterdruck-Haltevorrichtung wird mittels

eines mit dieser lösbar verbundenen Kolbensaugrohrs (13) auf einer Anlagefläche festgesetzt und kann eine Aufnahme zur Gerätehalterung (2) aufweisen.

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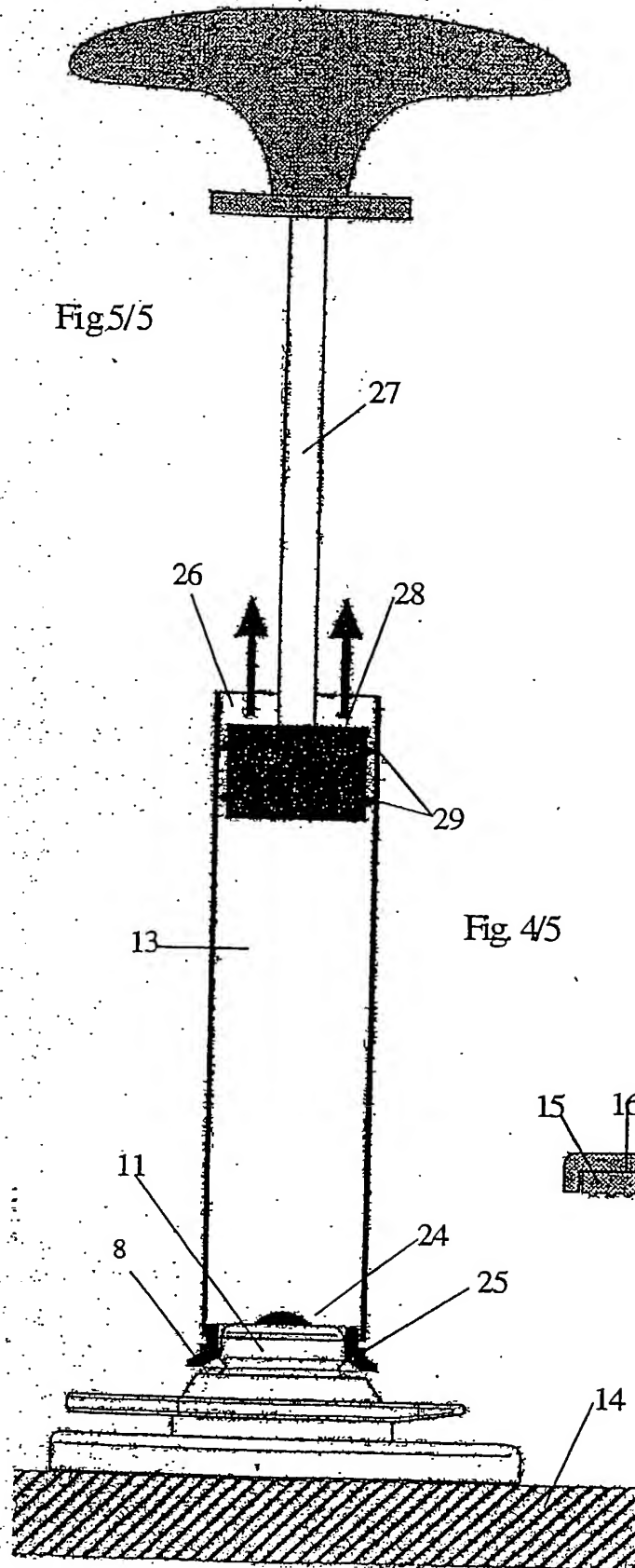
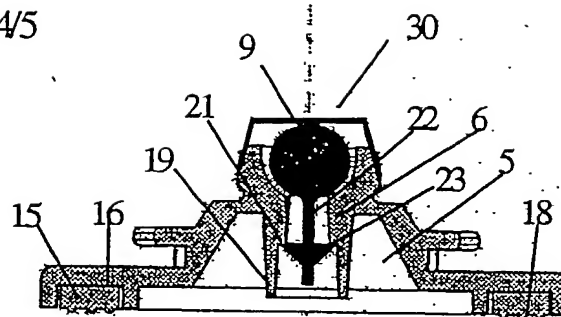
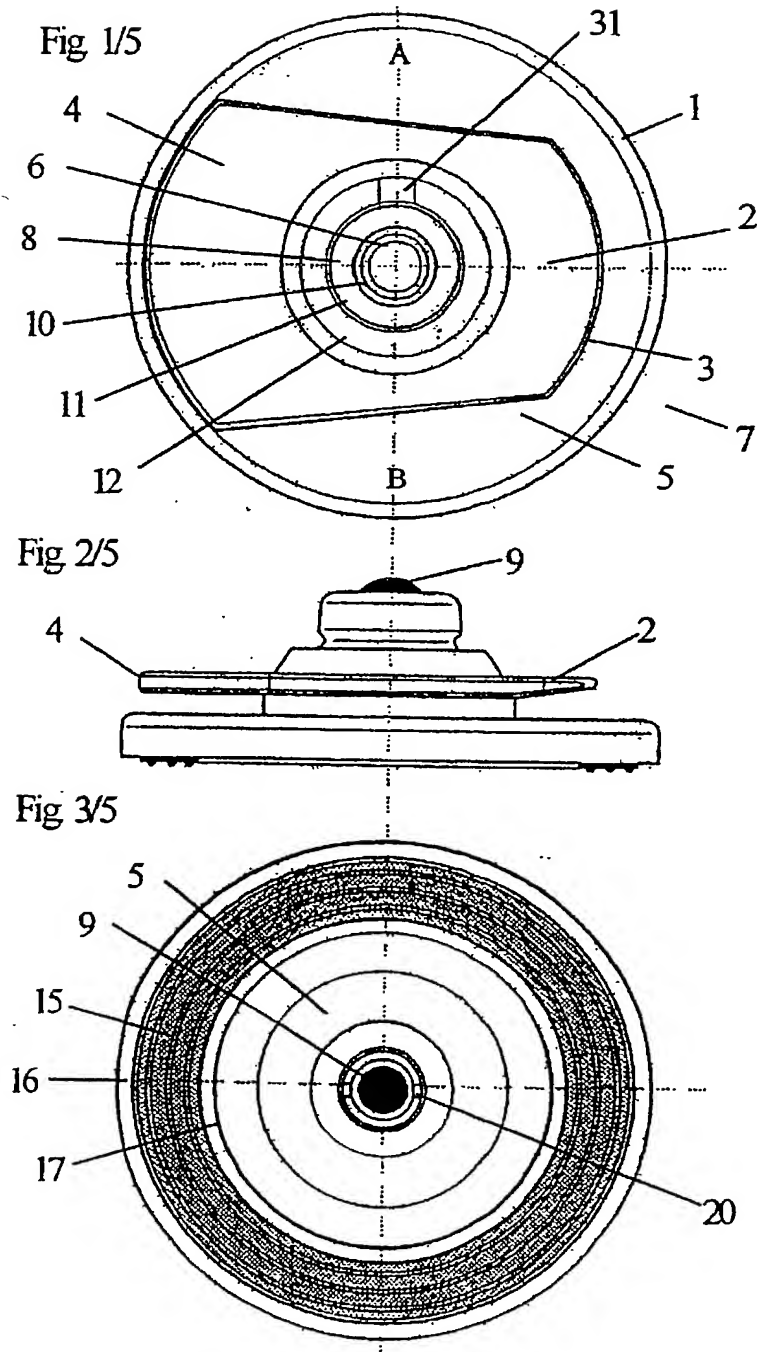


Fig 4/5





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First Named Inventor	RISTAU et al
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COMPLETE IF KNOWN

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Filing Date	July 19, 2000
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VACUUM HOLDING DEVICE

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the coefficient of  $\lambda$

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Application Number: PCT/JP00/02362

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 undersigned and that they are true and correct.

1. See the supra in the captioned matter to request information of status in File 37 under Federal Regulations 51.55.

I hereby claim, for my benefit, under Title 35 United States Code § 110 (a)-(d) or § 365(a) of any foreign application for patent or invention, or for (b) if any PCT International application which designated at least one country other than the United States of America, filed before and published in the United States, by checking the box, my foreign application for patent or invention designated, or of any PCT International application having a filing date before that of the application on which priority is claimed.

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☐ Additional foreign applications numbers are listed on a separate page attached below

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## DECLARATION

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Patent Office Number

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

Section 104.14 PGY instruction and application numbers are based on a supplemental priority sheet attached behind.

As a sworn inventor, I hereby affirm the following registered practitioners to prepare this application and to file it for all business in the Patent and Trademark Office mentioned hereafter:

Name	Registration Number
Bierman, Muserlian and Lucas	18,818
Jordan B. Bierman	18,629
Charles A. Muserlian	19,683
Donald G. Lucas	31,275

☐ Additional registered practitioner(s) named on a supplemental form attached hereto.

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[illegible]

☐ A petition has been filed to this assigned invention.

Name of Soldier in First Army.		Address	Family Name	Signature	Date e.g. 1-1-41
Given Name	HAROLD	Address	Family Name	Signature	

Inventory Signature	H. H.	DATE	
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☒ Additional inventors are being named on supplemental sheet(s) attached hereto